

SPONTANEOUS TORSION OF THE PEDICLE OF
OVARIAN TUMORS; WITH THE REPORT OF
A CASE OF ROTATED OVARIAN CYST
WITH EXTENSIVE INTRA-MURAL
HÆMORRHAGE.¹

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THE accident of torsion of the pedicle of ovarian tumors was first pointed out by Rokitsansky² in 1841, though it was not till 1865 that the subject attracted any considerable attention.³ At that time he published a report of thirteen cases, eight of which were met in fifty-eight patients who had died with ovarian tumors. He regarded it as an occurrence of no great rarity, his statistics showing that it occurred in 13 per cent. of ovarian tumors. Schroeder⁴ met with thirteen cases among ninety-four ovarian tumors, or 13.8 per cent. Two cases of twisted pedicle were found in a series of twenty-four tumors of the ovary treated in the Methodist Episcopal Hospital during the last six years. Of these I shall speak later. As we meet the condition at the present time, it is considerably rarer than the figures of Rokitsansky would show. Thornton explains this by the fact that it is now the rule to operate early upon ovarian tumors, and they are not allowed to go on to rotation. The statistics which he has compiled show the percentage of rotated tumors to be about 9.5 per cent.

As early as 1855, Patruban⁵ reported a case of ovarian

¹ Read before the Brooklyn Surgical Society, January 4, 1894.

² Rokitsansky: *Handbuch der Patholog. Anatomie*, Vol. 1, 1841.

³ Rokitsansky: *Zeitschrift der K. K. Gesellschaft der Aerzte in Wien*, 1865.

⁴ Schroeder: *Viet—Archiv für Gynæcologie*, 1878.

⁵ Patruban: *Oesterreichisches Zeitschrift für practische Heilkunde*, 1855.

cyst, in which the pedicle became twisted and the patient died of a rapid intra-cystic hæmorrhage.

Edwards¹ reported in 1861 the case of a woman with a cystoma of the right ovary who developed symptoms of rotation on the sixth day after delivery. She went into a state of collapse on the first day, and died on the second day after the accident. The autopsy showed a thin-walled, livid purple tumor, mottled with bloody extravasations. The peritoneal covering was lacerated in three places, one rent being an inch and a half long. From one of these rents protruded a clot. The cyst was distended, with claret-colored fluid.

Peaslee² speaks of three cases of ovarian fibroids, larger than the foetal head, with twisted pedicles. James Crane's case, of which he also speaks, was a multilocular cyst complicating pregnancy. Twenty-four hours before labor commenced the patient had been seized with agonizing pains in the left iliac region. She died of peritonitis five days after delivery. The tumor was found at the autopsy of a dark-purple color, almost black, with several perforations in its walls.

Perry³ reports the case of a woman with a movable tumor in the left side of the abdomen, who, while walking, was suddenly seized with pain in the left iliac region, and went at once into a state of profound collapse. The tumor was observed to enlarge rapidly during twenty-four hours. After two days the very acute pain and tenderness disappeared. The tumor underwent but little change in size. At the end of a month her condition was better than before the accident.

Wiltshire⁴ published a report of a patient who had carried an abdominal tumor for several years, and who, after an unusual exertion, suddenly developed excruciating pain, referred to the tumor, and went into a state of collapse. The tumor rapidly increased in size. The patient was subjected to operation. On puncturing the tumor a gallon of dark blood is described as

¹ Edwards: *London Lancet*, Vol. II, p. 336, 1861.

² Peaslee: *Ovarian Tumors*, 1872, p. 80.

³ Perry: *American Journ. of Obstetrics*, Vol. IV, 1871, p. 454.

⁴ Wiltshire: *Transactions of the Pathological Soc. of London*, Vol. XIX, p. 295.

escaping through the trocar. The pedicle was found to be twisted, and so friable that the body of the uterus had to be transfixed with the ligature in order to control the bleeding.

Barnes¹ has reported two cases of sudden hæmorrhage into the sac of ovarian tumors following twisting of the pedicle. One of the cases complicated pregnancy. The patient died from rupture of the sac and bleeding into the peritoneal cavity.

Seiley,² in 1864, reported an important case, in which the woman was seized with the symptoms of shock six days after delivery. She improved gradually for thirteen days, when the symptoms recurred, and she died six days later. The autopsy revealed an ovarian cystoma with a twisted pedicle. The tumor had ruptured and contained thick blood and clots.

A rare accident is reported by Spencer Wells, in his work on "Diseases of the Ovaries," 1873. Two cases have come under his notice, in which the pedicle had become twisted entirely off from its attachment. One of these was a dermoid cyst; the other was a multilocular cystoma. The tumors were nourished by vessels passing through the adhesions to the omentum and intestines. Both tumors were removed, and both patients recovered.

The same author³ reported to the Obstetrical Society of London the case of a woman in whom pregnancy was complicated by an ovarian tumor. Labor came on at six months. One week after delivery severe pain developed in the tumor, and it rapidly increased in size. Ten days later, while turning over in bed, she screamed that something inside had broken, and died almost instantly. The tumor had totally disappeared.

A case is reported by Klob,⁴ in which intestinal obstruction was caused by an ovarian tumor with a twisted pedicle.

In 1880, Mr. Tait⁵ read a paper founded upon three cases. The first of these cases he operated upon for hernia. The autopsy showed an ovarian cyst with a twisted pedicle.

¹ Barnes: St. Thomas's Hospital Reports, N. S., Vol. 1, pp. 355, 376.

² Seiley: Edinburgh Medical Journal, 1864, p. 464.

³ Spencer Wells: Transactions of the Obstetrical Soc. of London, Vol. XI, p. 254.

⁴ Klob: Pathologische Anatomie der Weiblichen Sexual-Organen, Wien, 1864.

⁵ Lawson Tait: Diseases of the Ovaries, 1883, p. 294.

Thornton¹ has compiled a table of fifty-seven cases occurring in 600 ovarian tumors. This table shows that torsion of the pedicle of ovarian tumors "is so frequently associated with pregnancy that this condition must be considered a predisposing cause." It also shows that dermoid cysts are especially liable to rotation. In four of the cases there was division of the pedicle and transplantation of the tumor. All four of these cases were dermoids.

A case operated upon by Dr. George R. Fowler,² in 1890, at the Methodist Hospital, in Brooklyn, presented a history of several attacks of lesser severity, brought on by washing clothes over a tub. From these the patient had recovered after a few days of rest. Three days before operation she had been seized with great pain in the right iliac region, a tumor had rapidly developed, and she had become greatly depressed. The operation showed a dark maroon-colored, monolocular cyst filled with reddish chocolate-colored fluid, containing much broken-down blood elements. The pedicle of the tumor was twisted three turns. The patient made a good recovery after extirpation of the tumor. It was my fortune to be an assistant at this operation, and I remember that the operator made the diagnosis of twisted pedicle before opening the belly.

Joseph Price,³ in November, 1893, read a paper in which he reported a case of cysto-sarcoma of the ovary in a young woman of seventeen, which had become strangulated by rotating four turns. The tumor was almost black. He reported another case of cystoma of the ovary, which after strangulation had increased rapidly in size. Both tumors were removed, and both patients recovered.

A. Ross Matheson⁴ has observed this condition in a woman sixty-three years of age, whom he found dying of acute intestinal obstruction. A tumor was discernible in the right iliac region where none had been discovered before. She died on the

¹ Thornton: *American Journ. of the Med. Sciences*, Vol. xcvi, Oct. 1888, p. 357.

² Fowler: *Brooklyn Med. Journ.*, Vol. iv, p. 459.

³ Price: *Annals of Gynecology and Pædiatry*, December, 1893, p. 139.

⁴ Matheson: Personal communication.

fourth day of the attack, and the autopsy revealed a monolocular cyst of the right ovary, not more than four inches in diameter, containing a clear, serous fluid. The pedicle was twisted one complete turn anteriorly from left to right. A band of adhesions attached the small intestine to the pedicle. In the rotating of the tumor, this band had been so dragged about the pedicle as to strangulate the gut and cause the obstruction, from which the patient died.

The same observer reported the case of a woman who had carried for many years a large abdominal tumor. After some indiscretion in diet, emesis developed. During an attack of vomiting she was suddenly seized with great pain in the region of the tumor. She suffered from acute intestinal obstruction, and at the end of three days died. The autopsy showed a fibro-cystic tumor of the right ovary, weighing twenty-five pounds, which had rotated anteriorly from left to right one complete turn. The tumor was perfectly free from adhesions; and the obstruction seemed to have been caused simply by pressure upon the gut. Dr. Matheson is of the opinion that the vomiting preceded all other symptoms and was the exciting cause of the rotation.¹

The case reported below, which was sent into the service of Dr. Pilcher at the Methodist Hospital by Dr. Matheson, I operated upon in August, 1893. Because of its certain unique features it is recorded somewhat in full.

Phœbe B., aged thirty-eight, single, dress-maker, five years before was suddenly seized with severe pain in the right iliac region. This persisted for six weeks, necessitating her remaining in bed during all that time. She recovered from this completely and again went to her work. Five weeks before operation she was again prostrated with a similar attack, which lasted ten days. These attacks she described as being of much the same character, coming on without any

¹ This was fifteen years ago. The woman, while carrying the tumor, had visited the leading gynecologists of Philadelphia, New York and Brooklyn, but could find no one willing at that time to undertake the operation of extirpation of the tumor, which she begged them to undertake. She herself had asked that, after her death, an autopsy be made. Thus it was that Dr. Matheson was able to report this extremely interesting case.

apparent cause while she was pursuing her ordinary work. The chief symptom was the great pain in the right iliac region, which was so severe as to cause profound prostration. Nausea, vomiting, and tympanitic distention of the abdomen were also present. There is no history of tumor having been diagnosed. Four days before admission to the hospital she was seized with another attack, which she described as precisely similar in its onset to the two previous ones, excepting that it had a more definite exciting cause. Some gastric derangement had excited vomiting, and during an attack of emesis the severe right iliac pain had suddenly developed as though a result of the vomiting. In addition to the prostration and pain of this last attack, she was unable to retain any food in the stomach. Her condition at the time of admission to the hospital was one of profound depression. The temperature was but slightly elevated. The pulse-rate was 130, and respiration 30. She was suffering intense pain, chiefly in the right iliac region, but radiating over the whole abdomen. The abdomen was distended and very tense, and exquisitely tender to the touch over its entire extent, but especially on the right side. No gas or fæces had been passed since the onset of the attack. An enema administered on the fourth day had been ineffectual. She was vomiting frequently a brownish-green material, having a slightly fæcal odor. An illy-defined tumor could be made out in the right side of the abdomen. The examination gave rise to so much pain that the symptoms of dullness on percussion and a sense of resistance on palpation had to suffice.

The symptoms of intestinal obstruction were sufficiently marked to justify operative interference, and the patient was anæsthetized. When she was placed on the table, percussion elicited a distinctly tympanitic note over the right iliac region, where but a few minutes before dullness had been discovered. Percussion further towards the median line revealed a dull note where before the anæsthetic had been begun was a distinct tympanitis. I opened the belly in the middle line and discovered a tumor, the surface of which presented much the appearance of a fresh placenta—a livid, dark maroon color, fairly smooth and firm in consistence. The hand swept around the mass showed it to be movable and somewhat larger than a good sized foetal head.

The uterus was identified and found to be free and of normal size. In order to remove the growth with greater facility it was incised, and about twenty ounces of perfectly clear, straw-colored fluid,

confined under a high degree of pressure, were evacuated. As the tumor collapsed, it was found to have for its pedicle the right Fallopian tube, which was considerably elongated and twisted upon its axis just one complete turn. Immediately on evacuating the cyst and untwisting the pedicle, the condition of the patient improved and gas began to pass out of the distended intestines. A loop of small intestine was found firmly adherent to the uterine end of the tube, and the rotation of the tumor had caused the gut to be dragged partly around the pedicle. This was not discovered till after the evacuation of the fluid and relief of the obstruction. The twist was from left to right, that is, suppose the tumor lying to the right side of the uterus, the anterior surface had rotated downward. The pedicle was ligated with a Staffordshire knot, the mass removed, and the abdomen closed. The patient's bowels moved five times during the following twenty-four hours. The temperature, which immediately after the operation was 103° , steadily declined, and after the second day never reached a point higher than 99.2° . The wound healed primarily, and the patient was discharged on the twenty-ninth day.

The tumor was a monolocular cyst of the ovary. Its wall varied in thickness from 0.4 centimetre to 4 centimetres. The thin areas, which were but a small part of the wall, were intensely congested. The larger part of the wall, however, was greatly thickened, the increase in dimension being due to an extensive hæmorrhagic infiltration, and presented much the feeling and appearance of a fresh placenta. Microscopic examination of sections made through the thickness of the wall showed, externally, a dense layer of fibrous connective tissue covered with peritoneum; internally, a similar layer about one millimetre thick; and between these two, a great area of loose, fibrillar connective tissue, containing within its meshes enormously distended veins, filled with firmly coagulated blood, arteries containing clots, and outside of the vessels, surrounding them on all sides, and making up the chief thickness of the wall, were fibrin and blood in various stages of coagulation. The blood, in many places, completely surrounded and supported the mural vessels, the connective tissue net-work being very delicate, so that the walls of the cyst were practically split, the hæmorrhage being contained between the two divided layers. The remains of ovarian tissue were spread out over the cyst wall for an area of six or ten centimetres in diameter. The ovarian veins and artery all contained firm clots in both the tumor and pedicle.

The peculiar and interesting feature presented by this case is the extensive intra-mural hæmorrhage without a sign of intra-peritoneal or intra-cystic bleeding. After searching the literature, the only mentions of intra-mural hæmorrhage which I have been able to find are in the report of Edwards's case, and in J. Bland Sutton's work on "Surgical Diseases of the Ovaries and Fallopian Tubes." In the former the autopsy showed that the tumor was "of a livid purple color, and there were patches of extravasated blood in its walls, which had given away." Bland Sutton simply gives a passing mention of extravasation of blood into the cyst wall.

In all of these cases there is, of course, more or less hæmorrhagic extravasation; but when this occurs to any considerable degree it seems to take place from the superficial and less-firmly supported vessels which quickly rupture through one or the other surfaces of the cyst wall. In this case the cystic contents were perfectly clear, as well as the small amount of serum in the peritoneal cavity. Yet this hæmorrhage was so sudden and extensive as to make evident a tumor where none had been discovered before.

When we now come to look into the etiology of this condition, it is evident that it is based upon simple mechanical principles. When we think of a freely-movable tumor, attached to the uterus by a slender pedicle, covered with peritoneum, and environed by smooth peritoneal surfaces of numerous and changing planes, it is not difficult to conceive how such a tumor might become rotated upon the axis of its pedicle, and how any of the abdominal actions by which the relations of the parts in contact with the tumor are constantly changed, might be the cause of such a rotation. An elongated pedicle, giving the tumor greater freedom to be acted upon by these rotating forces, is, therefore, a predisposing cause. It is possible, however, for the very forces which cause the rotation to also cause an elongation of the pedicle; so that we cannot always say whether the elongated pedicle is a cause or a result.

The contour of the tumor must have an important bearing. Thornton¹ has called attention to the fact that the dermoid

¹ Thornton: *The Medical Times and Gazette*, 1877, Vol. 11, p. 82.

tumors are much more prone to undergo rotation than any other variety of ovarian growths. This is easily explained by the nodular projections on the surface of these tumors, which offer shoulders against which the rotating forces may be exerted. These projections may also act as ratchets, and, becoming engaged with bony prominences, prevent unwinding.

Statistics show that tumors with twisted pedicles are usually of small size, for tumors which have reached any considerable size have adhesions, and have become more or less adapted to the shapes of the surrounding parts. Thirty-six of those appearing in Thornton's table of fifty-seven weighed less than ten pounds; many weighed five pounds or under; and only eight weighed twenty pounds or over.

The repeated filling and emptying of the urinary bladder has been suggested by Klob¹ as a cause of rotation.

The cases of Edwards, Crane, Barnes, Seiley, Wells, and Thornton, mentioned above, show the intimate connection between this condition and pregnancy. An examination of Thornton's tables shows that 16 per cent. of the cases were associated with pregnancy, and that in 5 per cent. of the cases the acute attack followed labor. He is of the opinion that the foetal movements have an etiological importance.² This same author has recorded three cases in which the diminution in the size of the tumor by tapping caused rotation to strangulation.³ He has also suggested the peristaltic action of the intestines as being of etiological importance.

A case which has been reported by Malins⁴ as due to tapping can hardly be put under that head. The patient had suffered from severe pain and tenderness over the tumor, and her general condition was very low. He drew off eight quarts of fluid, the acute symptoms of strangulation disappeared, and her condition became greatly improved. Three weeks later he operated and found a twisted pedicle, and the cyst walls deeply con-

¹ Path. Anat. der Weiblichen Sexual-organe, Wien, 1864.

² Thornton: Medical Times and Gazette, 1877, Vol. II, p. 82.

³ Thornton: Am. Journ. of Med. Sci., Vol. xcvi, p. 357.

⁴ Malins: London Lancet, 1877, Vol. I, p. 529.

gested. The tapping had evidently but relieved the tension in an already rotated cyst.

Tait¹ has suggested that the movements of the faecal mass through the intestines might have something to do with rotation.

The acute onset has been associated with an attack of constipation. The sudden stoppage of menstruation by exposure to cold has also figured as an exciting cause. The changes of position of the tumor caused by respiration, walking, lying, and other ordinary body movements, palpation of the tumor, and ascites, may also be regarded as etiological factors; and Mathe-son's case and the one which I have reported are traceable to an attack of vomiting.

Sudden strain or change of position and direct violence frequently act as the immediate exciting cause. Finally, there is often no history of exciting cause.

Of course, the pedicle of an ovarian tumor will stand a certain amount of torsion without giving any symptoms. Beyond this, up to a certain point, the symptoms are vague and illy-defined. But a point is reached in the process of torsion, beyond which marked circulatory disturbances must result; and it is the sudden passing of this point that gives rise to the very acute and characteristic symptoms of the disease. First, the venous return is shut off because of the lesser degree of resistance to outside pressure in the walls of the veins. The acute symptoms begin the moment when blood is being pumped into the tumor through the arteries while the compressed veins are unable to return it. As a result of this the tumor suddenly becomes engorged with blood. This causes an extravasation of serum, an over-distention and rupture of the smaller vessels, and a consequent enlargement in the size of the tumor.

In more than half of Thornton's cases the cyst was distended with blood, and in none is it noted that the cystic contents were clear. The blood contained in these cysts varied from bright red, fresh blood, to clots in all stages of coagulation and disintegration. This hæmorrhage may be so severe as to cause death.

¹ Tait: Transactions of the Obstet. Society of London, 1880, Vol. xxxi, p. 86.

Another alarming symptom is that of intestinal obstruction. Klob,¹ in 1864, called attention to this complication ; and Spencer Wells² has more recently referred to it. It can be accounted for by the sudden increase of pressure upon the intestines due to the enlargement of the tumor. Adhesions may also play an important *rôle*, for in the case which I have reported the small intestine was bound by adhesions to the twisted pedicle. Another cause is found in the fact that a woman suffering from this condition, with the general depression and the severe pain incident to every motion, is disposed to suppress rather than encourage a movement of the bowels. I am also inclined to believe that the obstruction in many of these cases is excited or aggravated by the opium which must be given in large amounts to control the pain.

The chief pain is referred to the pedicle, and is due to pressure upon the ovarian nerves. In severe cases there is pain and tenderness over the whole tumor from the tension and pressure upon the spread-out filaments of ovarian nerves in the wall of the tumor. In some cases the pain radiates over the abdomen and down the thigh. Thornton³ mentions a case in which the patient had two acute attacks, in both of which the pain was on the left side. Operation performed during the second attack revealed a twist of the pedicle of a tumor of the right ovary.

Other symptoms are those of hæmorrhage associated with the depression due to severe intra-abdominal pain. These symptoms are quickly complicated or supplanted by those of other peritoneal disturbances.

Any sudden attack of prostrating pain in the region of the ovary, especially in a patient who is known to have an ovarian tumor, should lead us to suspect a twisted pedicle. The suspicion would be all the greater should the attack occur in connection with pregnancy. It must always be borne in mind, however, that these attacks may occur in patients whose tumor has never been discovered.

Because of the great tenderness a satisfactory palpation cannot be made ; but some observers have been able, by vaginal

¹ Klob : *Pathologische Anatomie der Weiblichen Sexual-Organen*, Wien, 1864.

² Wells : *Ovarian and Uterine Tumors*, 1882.

³ Thornton : *The Medical Times and Gazette*, 1877, Vol. II, p. 82.

examination, to discover the tender, twisted pedicle to one or the other side of the uterus. Rapid increase in the size of the tumor is another important sign.

These symptoms, when occurring in complication with other abdominal disease, may be a source of confusion. For example, Mr. Tait operated upon a case of hernia, which died four or five days later of a rotated ovarian cyst. The result of the autopsy made him believe that the symptoms which he had hoped to relieve by operating on the hernia were not symptoms of the hernia at all, but were due to the twisted pedicle.

Mann, in the *American System of Gynecology*, speaks of a case in which three complete turns were found in an ovarian pedicle, which had come on so slowly as to give no symptoms. It is a question, in my mind, whether a sudden twist, in which both artery and veins were occluded at the same instant, would not give fewer symptoms than a slow twisting in which the veins were occluded for a considerable length of time before the arterial supply was shut off.

The same author speaks of a case which presented the clinical picture of rotation, in which the symptoms were due to rapid elongation of the pedicle. An ovarian cyst, during pregnancy, had become adherent to the diaphragm and structures high up in the abdomen, and the contraction of the uterus, after delivery, had so dragged upon the pedicle as to give rise to strangulation of the vessels.

The above reports of recurrences and spontaneous relief show that it is possible for the tumor to untwist; in fact, this is not an infrequent outcome. If, however, the venous return remains obstructed, and the patient does not bleed to death, the result must be a coagulation of blood in the veins and also in the arteries supplying the tumor through the pedicle. If there are vascular adhesions to the neighboring structures, even when the circulation through the ovarian vessels is shut off, the tumor may continue to live, as is shown in the two cases of Wells'. But if the tumor is without such adhesions, it then has no circulation and becomes, in a pathological sense, an infarction. The destiny of such a foreign body in the abdomen must vary with a

multitude of circumstances, depending chiefly on the size and the presence or absence of infection. Under ordinary conditions, adhesions would be set up and the body eventually become replaced by a mass of fibrous tissue, as occurs with bits of liver or kidney which have been experimentally introduced into the peritoneal cavity. I have seen a transplanted abdominal tumor the central portion of which had undergone calcareous degeneration.

The cells of such a tumor are capable of retaining their vitality for a long time, being nourished by the large amount of blood which surrounds them, until a fresh supply is brought through the adhesions, when the tumor may continue to grow as before. In the case of a cyst, it is also conceivable that its secreting cells might soon enough receive nourishment from the new source to continue to functionate as before. We know that the animal cell is capable of retaining its vitality free in the peritoneal cavity for a long time; and examples of the migration, transplantation and renewed growth of intra-abdominal tumors are numerous.

The comment of Spencer Wells,¹ that gangrene is inevitable if the rotations are so complete and enduring as to strangulate the arteries, is not in accord with our present knowledge. It is true that such an imperfectly nourished tumor-mass is a *locus minoris resistentiæ*, and very prone to become the seat of bacterial development. Such organisms may gain admission from within, from the tubes, or by tapping. The prognosis of the unoperated case, under such circumstances, becomes a very different one.

Thornton has figured the mortality in the cases upon which he has operated at 7 per cent. Of the four deaths, two were certainly due to the previous infection of the cyst by tapping, and not to any effects of rotation. He regards the dangers of operation as scarcely more than those in operation upon the uncomplicated cases.

In conclusion, judging from the foregoing cases, I may say that the two great dangers to be apprehended in cases of rotated ovarian tumors are hæmorrhage and intestinal obstruction; and in these two dangers is sufficient justification to regard the lesion as one of emergency, demanding operative relief.

¹ Wells: Ovarian and Uterine Tumors, 1882.